


60. The tool piece according to Claim 56, wherein the binder of the hardmetal bodies is selected from the group consisting of cobalt, nickel and iron and their alloys.

61. The tool piece according to Claim 21, wherein the binder of the hardmetal body comprise a composition substantially different from the binder of the additional hardmetal body.

62. The tool piece according to Claim 25, wherein the binder comprises cobalt or cobalt alloys.

63. The tool piece according to Claim 48, wherein the binder of each hardmetal body is about 0 wt.%. to about 25 wt.%. 

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1.(Amended)A tool piece comprising:

- (a) a hardmetal body;
- (b) an additional body contiguously contacting the hardmetal body; and
- (c) a substantially discontinuous gradient-free boundary, formed at a temperature less than a temperature for forming a liquid phase and a superatmospheric pressure, between the hardmetal body and the additional body.

15.(Amended)A tool piece, the tool piece comprising:

- (a) a hardmetal body including a hard particle component and a binder;
- (b) an additional body contiguously contacting the hardmetal body; and
- (c) a substantially discontinuous gradient-free boundary, formed at a temperature less than a temperature for forming a liquid phase and a superatmospheric pressure, between the hardmetal body and the additional body.

Remarks

The Applicants first wishes to thank the Examiner for the courtesy extended to Applicants' attorney during the Telephonic Interview on June 20, 2002.

The Office Action mailed April 29, 2002 has been carefully considered. After such consideration, Claims 26-41 are canceled without prejudice as being directed to a non-elected invention, new Claims 42-63 have been added and Claims 1, 15 and 25 have been amended to more particularly define the Applicants' present invention along the lines suggested by the Examiner. As such, Claims 1-25 and 42-63 remain in the case with none of the claims being allowed.

Initially, the Office Action stated that there were two separate patentable inventions within the application:

- Group I. a tool piece as described in Claims 1-25; and
- Group II. a method for forming a tool piece as described in Claims 26-41.

During a telephone conversation with the Examiner on September 21, 2001, Claims 1-25 were selected for examination in the current application. Newly added Claims 42-63 depending from independent Claim 25 belong to the invention of Group I.

The Office Action had rejected Claims 1-25 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Office Action stated that (a) the term "substantially discontinuous gradient-free boundary" in Claims 1, 15 and 25 is indefinite; (b) the term "a periodic function subdivided into a finite number of continuous intervals within it[s] period" in Claim 9 appears to read on any symmetrical geometry; and (c) the term "truncated versions of any of the preceding" in Claim 10 is unclear and without guidance to limitation within the disclosure.

The amendment of Claims 1, 15 and 25 along the lines suggested by the Examiner renders the 35 U.S.C. 112, second paragraph, rejection relating to the term "substantially discontinuous gradient-free boundary" moot.

Concerning the term "a periodic function subdivided into a finite number of continuous intervals within it[s] period" in Claim 9 and the term "truncated versions of any of the

preceding" in Claim 10, the Examiner's attention is directed to, among other place page 15, lines 4-26 that describe details of such a periodic function and truncated curves. For the Examiner's convenience, page 15, lines 4-26 are reproduced below.

Some macro and/or micro interfacial features of mating surface 16 may be represented as a periodic function that may be subdivided into a finite number of continuous intervals within its period. Such a function may be expanded in its interval into a convergent series known in mathematics as a Fourier series. See for example, Gieck, K. "Arithmetic: Fourier Series" in: Engineering Formulas (New York, NY, McGraw-Hill Book Company 1979, pp. D12-D14), which is herein incorporated by reference. Macro and/or micro interfacial features that may be represented using Fourier series include symmetrical features and asymmetrical features. Some examples include half circles, half ovals, half ellipses, triangles, sawtooth curves, and truncated versions of any of the preceding. In addition, an interfacial feature having frequency modulation, amplitude modulation, and frequency and amplitude modulation may be represented by a Fourier series. To that end, applicants contemplate that any macro and/or micro interfacial feature having mating surface strength enhancing ability may be represented as a Fourier series and may be used as a mating surface 16.


The 35 U.S.C. 112, second paragraph, rejections of Claims 1-25 being either rendered moot by amendment or overcome by argument should be withdrawn

The Office Action had rejected Claims 1-5 and 7-25 under 35 U.S.C. 102(b) as being anticipated by US Patent No. 2,888,247 (Haglund). The Office Action also had rejected Claim 6 under 35 U.S.C. 103(a) as being unpatentable over Haglund. Applicants submit that independent Claims 1, 15 and 25 as amended, patentably distinguishes over the art of record and, thus, render the 35 U.S.C. 102(b) rejection and the 35 U.S.C. 103(a) rejection moot. That is, the art of record, whether taken alone or in combination, neither discloses nor suggests a tool piece comprising a hardmetal body, an additional body contiguously contacting the hardmetal body and a substantially discontinuous gradient-free boundary, formed at a temperature less than a temperature for forming a liquid phase and a superatmospheric pressure, between the hardmetal body and the additional body.. Dependent Claims 2-14, 16-24 and 42-63, are patentable over the

art of record for at least the same reasons put forth with respect to independent Claims 1, 15, and 25. The 35 U.S.C. 102(b) rejection and the 35 U.S.C. 103(a) rejection being moot should be withdrawn.

The Applicants submit that by this amendment they have placed the case in condition for immediate allowance and as such respectfully request a notice of allowance directed to Claims 1-25 and 42-61. However, if any issue remains unresolved, Applicants' attorney would welcome the opportunity for a telephone interview to expedite allowance and issue.

Respectfully submitted,



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Marked Up Version of Paragraph
Starting At Page 13, Line 17 And Bridging To Page 14, Line 7
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In an aspect of the present invention, the mating surfaces may be described as being symmetrical, for example, about an axis or plane or even exhibiting rotational symmetry or mirror symmetry. Similarly, the mating surfaces may be described as being asymmetrical. Applicants have found that when the bodies of a multiple-region body have substantial size disparities, it is advantageous for the mating surface to be asymmetrical. For example, when an additional body having a thickness of about 20-30 μm is incorporated on a hardmetal body in the centimeter scale, asymmetrical mating surfaces provide superior integrating in the resultant multiple-region body. Applicants believe that arrangement of a hardmetal body and an additional hardmetal body would be particularly advantageous when the additional hardmetal body comprises a superhard filler hardmetal body such as that disclosed in commonly assigned U.S. Patent No. 6,372,012 that issued on April 16, 2002 from U.S. Application Serial No. 09/616,112, entitled A SUPERHARD FILLER HARDMETAL INCLUDING A METHOD OF MAKING, filed on July 13, 2000, in the names of S. Majagi, J. Eason, and R.W. Britzke, the disclosure of which is hereby incorporated by reference herein.

25. A tool piece, the tool piece comprising:
- (a) a hardmetal body including a hard particle component and a binder;
 - (b) an additional body contiguously contacting the hardmetal body;
 - (c) a substantially discontinuous gradient-free boundary, formed at a temperature less than a temperature for forming a liquid phase and a superatmospheric pressure, between the hardmetal body and the additional body; and
 - (d) a mating surface between the hardmetal body and the additional body.

Please add New Claims 42-63 as follow:

--42. The tool piece according to Claim 25, further including a mating surface between the hardmetal body and the additional body.--

--43. The tool piece according to Claim 42, wherein the mating surface includes a male portion on one of the bodies and a corresponding female portion on the other of the bodies.--

--44. The tool piece according to Claim 43, wherein the mating surface is symmetrical.---

--45. The tool piece according to Claim 44, wherein the mating surface is axially symmetrical.--

--46. The tool piece according to Claim 45, wherein the mating surface is dimpled.--

--47. The tool piece according to Claim 43, wherein the mating surface is asymmetrical.--

--48. The tool piece according to Claim 43, further including both micro and macro mating features.--

--49. The tool piece according to Claim 48, wherein the micro and macro mating features are represented as a periodic function subdivided into a finite number of continuous intervals within its period.--

--50. The tool piece according to Claim 48, wherein the micro and macro mating features include one or more of half circles, half ovals, half ellipses, triangles, sawtooth curves, and truncated versions of any of the preceding.--

--51. The tool piece according to Claim 48, wherein the micro feature and macro feature comprise a macro feature area to a perturbed macro feature area ratio comprising slightly greater than about 1:1 to about 1:50.--

--52. The tool piece according to Claim 51, wherein the micro feature and macro feature comprise a macro feature area to a perturbed macro feature area ratio comprising slightly greater than about 1:1 to about 1:10.--

--53. The tool piece according to Claim 48, wherein the micro mating feature comprises a size of about 100 μ m to about 1cm.--

--54. The tool piece according to Claim 25 wherein the hardmetal has a porosity rating of no higher than substantially A06, B00, C08 to better than substantially A02, B00 and C00.--

--55. The tool piece according to Claim 25, wherein the additional body comprises at least one of a metal body, a ceramic body, and an additional hardmetal body.--

--56. The tool piece according to Claim 25, wherein the additional body comprises at least one additional hardmetal body including a hard particle component and a binder.--

--57. The tool piece according to Claim 56, wherein the hard particle components are a carbide.--

--58. The tool piece according to Claim 57, wherein the carbide is a tungsten carbide.--

--59. The tool piece according to Claim 58, wherein the carbide grain size is about 0.2 μm to about 40 μm .--

--60. The tool piece according to Claim 56, wherein the binder of the hardmetal bodies is selected from the group consisting of cobalt, nickel and iron and their alloys.--

--61. The tool piece according to Claim 21, wherein the binder of the hardmetal body comprise a composition substantially different from the binder of the additional hardmetal body.--

--62. The tool piece according to Claim 25, wherein the binder comprises cobalt or cobalt alloys.--

--63. The tool piece according to Claim 48, wherein the binder of each hardmetal body is about 0 wt.% to about 25 wt.%.--